Growing WILD

Spring, 1998

Utah's Project WILD Newsletter

Utah's Fabulous Native Fishes!

When Anglo-European settlers arrived in the mountain valleys of the Great Basin during the mid 1800s, they found native people making a living by utilizing the vast natural resources of the region. Historical records are especially replete with notations of a variety of fish being utilized. Nets, hooks, setlines and traps were used in all their variety in an attempt to tap into the wealth of aquatic life to be found in the cool, clean waters of the basin. While fishing may not have been widely practiced throughout drier parts of the region, evidence exists to suggest that for those living around the larger lakes and rivers, fishing was a major part of their subsistence.

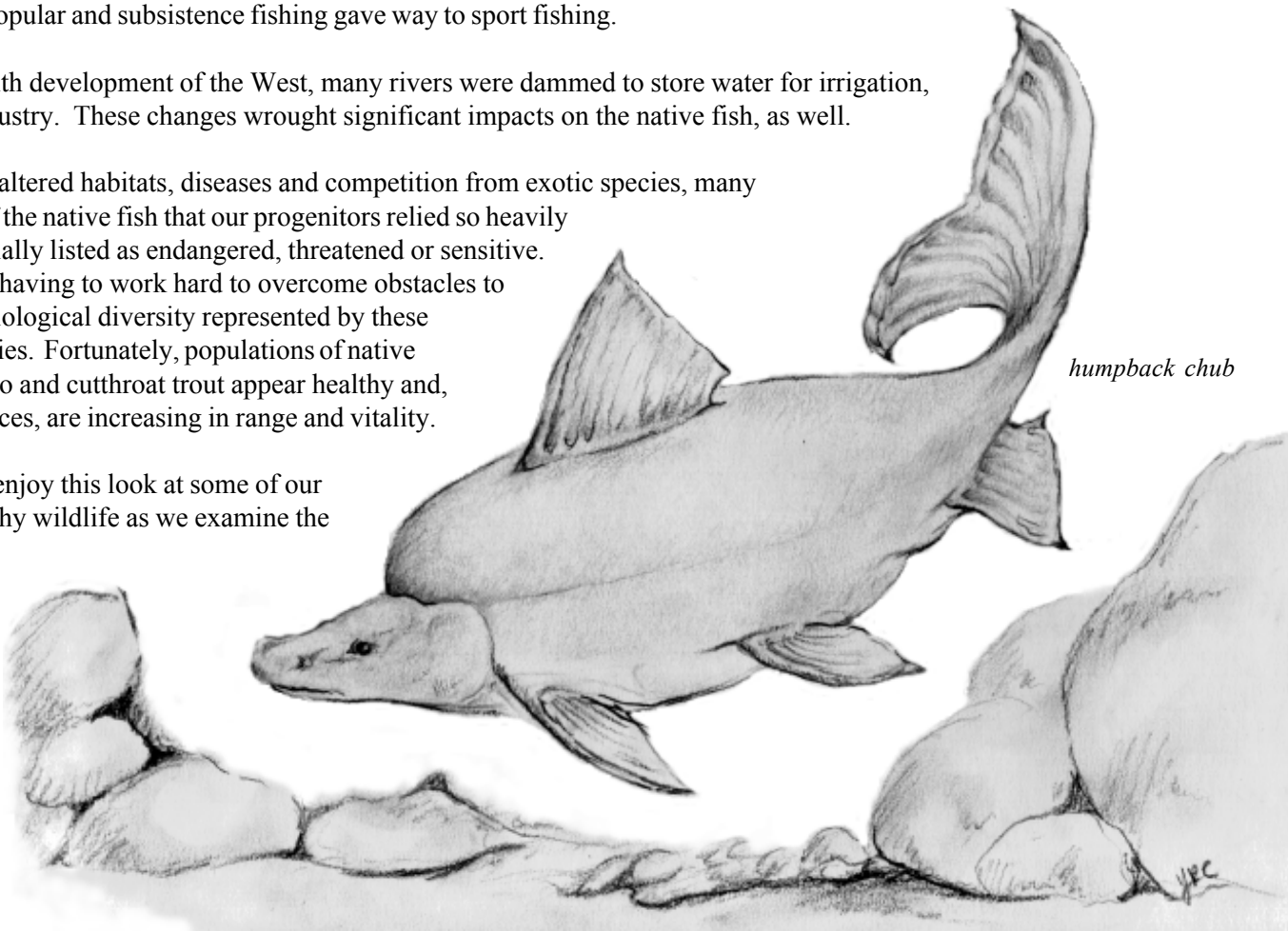
As European settlers innundated the region, settlements began to spring up, generally around major waterways. Taking a lesson from their native predecessors, these settlers utilized the native fish of the area to supplement the meager harvest of their agricultural efforts. Throughout their respective ranges, squawfish, chubs, suckers, whitefish, cisco and native trout were prized. Whole communities would gather to net the native fish. Many were eaten at the fish-fry that became the capstone of such events. Others were taken home and canned or otherwise preserved for the long winter months ahead. Young boys even reported earning spending money by selling the now endangered fish to local markets and restaurants.

Following the Great Depression of the 1930s, as people became less reliant on the native fish, a corresponding change in attitude towards the natives became evident. Interest faded in comparison to the exotic trout that had been introduced into many waterways. Native species were often considered "trash fish," as exotics became increasingly popular and subsistence fishing gave way to sport fishing.

In addition, with development of the West, many rivers were dammed to store water for irrigation, power and industry. These changes wrought significant impacts on the native fish, as well.

Today, due to altered habitats, diseases and competition from exotic species, many populations of the native fish that our progenitors relied so heavily upon are officially listed as endangered, threatened or sensitive. Biologists are having to work hard to overcome obstacles to preserve the biological diversity represented by these declining species. Fortunately, populations of native whitefish, cisco and cutthroat trout appear healthy and, in some instances, are increasing in range and vitality.

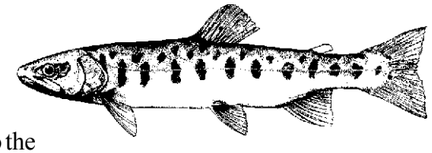
We hope you enjoy this look at some of our most noteworthy wildlife as we examine the history and management of some of Utah's Fabulous Native Fishes.



humpback chub

Fish Tales!

Bonneville Cutthroat Trout: *Oncorhynchus clarki utah*



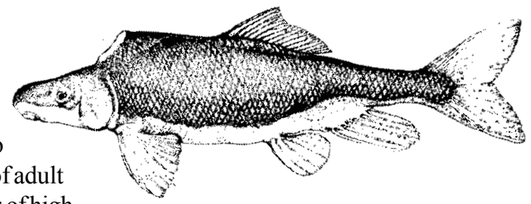
In 1997, the Bonneville cutthroat trout, Utah's only native trout, became our new State Fish. The Bonneville cutthroat trout is thought to have evolved from an ancestral cutthroat species isolated thousands of years ago when the Bear River, which once flowed into the Snake River, was diverted by volcanic activity and began flowing southward creating the ancient Lake Bonneville.

In the ancient Lake Bonneville, this cutthroat subspecies developed adaptations that allowed it to flourish and expand its range throughout the lake and into peripheral watersheds. Later, Bonneville cutthroat trout thrived in remnant lakes and streams left as Lake Bonneville transformed into the Great Salt Lake. When settlers first arrived, cutthroat trout were noted to be quite abundant. Over time, however, unregulated commercial fishing, degradation of watersheds, including flow decreases and lowered water quality, and introduction of exotic trout species led to a serious decline of this subspecies.

Today, 40 populations of Bonneville cutthroat trout can be found within five drainages around the Bonneville Basin: the Snake Valley, Virgin River, Sevier River, Jordan River and Thomas Fork/Smith Fork drainages. In addition, a lacustrine (lake) population exists in Bear Lake.

Due to its limited distribution, during the past 20 years fisheries biologists have undertaken a variety of projects to revive populations of native cutthroats. Hopes are to eventually promote this native trout as a sport fish in lieu of exotic trout in selected waters of the state.

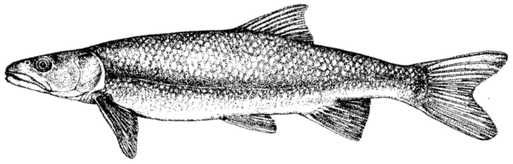
Razorback Sucker: *Xyrauchen texanus*



The razorback sucker, a fish that evolved more than four million years ago, is the largest native sucker in the western United States. It can reach lengths of three feet and weigh up to 13 pounds. Its name refers to a large, sharp-edged, keel-like bony ridge (hump) present on the backs of adult fish. This ridge is thought to have stabilized the fish during former periods of high spring runoff characteristic of pre-dam rivers of the Colorado River Basin. They are an olive to dark brown color above, with pink to reddish-brown sides and a yellowish underside. They have large fleshy mouths through which they filter algae, aquatic insect larvae, plankton and crustaceans suspended in the water and covering the bottom of rivers.

The razorback sucker was once widespread throughout the Colorado River system from Wyoming to Mexico, and was commercially harvested in abundance. Today, they are rare and are a federally listed Endangered species. Utah's largest remaining population of between 750 and 1,200 individuals is found in the Green River below Split Mountain. During spring, they occupy slow running sand, gravel and cobble runs, flooded bottomlands, and eddies formed at flooded mouths of tributary streams. In winter, they take up a relatively sedentary position in deeper waters.

Virtually all the remaining wild razorbacks are older than 20 years. Although successful spawning has been observed, almost no young over one and a half inches in length have been found, indicating little to no recruitment of young into the population. Predation by exotic fish species and lowered availability of food are considered the main causes of juvenile death. Continuous efforts to stock young razorbacks have had poor success in establishing reproducing populations, and at this point, recovery efforts are focusing on research into increasing survival of young and restoring habitat.



Colorado Squawfish: *Ptychocheilus lucius*

The Colorado squawfish, a member of the minnow family, *Cyprinidae,* isn't very small, as one might think. In fact, it is the largest minnow species native to North America reaching lengths of five feet and weighing up to 80 pounds! Squawfish are powerful predatory fish with long, pikelike snouts and large extendable jaws. Their Latin genus name, *Ptychocheilus*, translates to "folded lip" and refers to the folds of skin on their mouths behind the jaw, and *lucius*, its species name, means "pike."

Squawfish prefer warm, silty waters deeper than three feet, in eddies, pools and protected pockets alongside main river channels. Spawning occurs in quiet backwater nursery areas. The adult fish provide no parental care, and eggs that are laid merely stick to gravel and boulders on the bottom of the river until the young emerge.

Colorado squawfish were once quite numerous throughout the Colorado River Basin, and inhabited entire reaches of the Colorado, Green, San Juan, White and Dolores rivers in Utah. They were a major food source for Native Americans and settlers in the region, and their white, flaky, sweet flesh was often preferred over that of native trout.

Colorado squawfish numbers began to decline drastically when the construction of large dams resulted in the flooding of extensive river stretches, severely altering natural flow and temperature regimes, and blocking migration routes to critical spawning areas. In 1976, it was granted federal Endangered status, and is now considered extirpated from about 75 percent of its historic range.

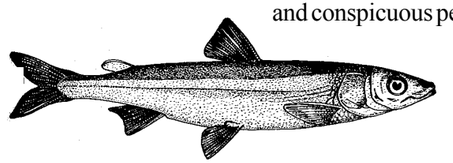
Currently, the greatest stronghold of Colorado squawfish in Utah is the Green River downstream of Echo Park. Along this stretch, surveys have yielded a good number of juveniles at least five years of age, which indicates squawfish are surviving and successfully reproducing. This may be partially a result of changes in the operation of Flaming Gorge Dam in 1978 to more closely match natural low, stable summer flows, and aquisition of easements protecting essential riverside floodplains.

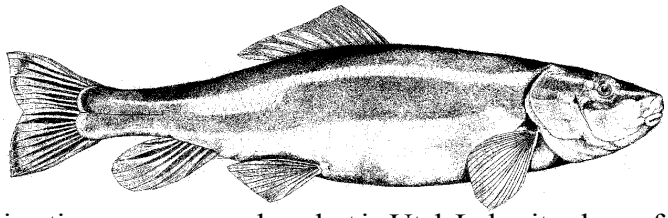
Bonneville Cisco: *Prosopium gemmifer*

The Bonneville cisco is one of four endemic fish of Bear Lake, the largest natural body of fresh water in Utah. Although it is a small fish, growing to less than eight and a half inches in length and weighing two and a half ounces, it is numerically the most abundant species in the lake.

Locally known as "peak nose" because of their pointed snout, they have an elongated slender body that is pale, mossy-green above with silvery iridescent sides, a pale pink-tipped snout and a few purple-tinged scales at the base of their caudal fins. They have no teeth, and feed primarily on zooplankton. They themselves are fed upon by other larger fish such as lake trout. Their eggs are an important food source for whitefish and sculpin also found in Bear Lake.

In the early 1900s Bonneville cisco were harvested by commercial anglers using fine mesh Swedish gill nets. They were sold, salted and cured at railroad stations for five cents each in Wyoming. Today they are a game fish, taken mainly by dip nets, and only during a short 16-day period each year in late January when they spawn. At this time, hundreds of thousands of cisco move from the cool depths inshore to spawn in waters at the edge of the lake. Males move inshore first and remain there, whereas gravid females move in only to lay their eggs and then retreat. During this breeding time, the cisco become a more brassy-yellow in color, and sport unusual and conspicuous pearly nodules that project from their scales along the whole length of their bodies. This may be what gives them their Latin species name, *gemmifer* which means "set with gems."





June Sucker: *Chasmistes liorus*

The June sucker, named for its peak spawning time, occurs nowhere but in Utah Lake, its place of origin. It is a relatively large, robust-bodied sucker that grows to over 23 inches in length, and has a wide, rounded head with a distinct hump on the snout, and a downward slanting mouth with only a few pappillae on the lips (reflected in its Latin species name *liorus* which means "smooth margin"). They are blackish or brown above in color, fading to flat white on the belly.

The June sucker is a slow-growing, long-lived bottom feeder well adapted to the turbid and saline shallow waters of Utah Lake. In the 1800s, they were an important food source for pioneers, and millions were commercially harvested. A significant drop in their population occurred however, with a series of droughts in the 1930s. Hundreds of tons of suckers were lost as the lake was nearly drained to supply water for irrigation. Events since then, including dam construction and water diversion projects throughout the Provo River watershed, have lowered their numbers to a point where they have become Endangered.

Today, less than 1,000 June suckers, most 25 years or older, remain in Utah Lake. In June, they travel about five miles up the Provo River to the Tanner Race diversion, a permanent upstream barrier, and spawn within shallow riffles above coarse gravel and cobblestones. Survival of offspring has been virtually nil since young are heavily preyed upon by bass and walleye that were introduced to the lake in the 1950s. Preserving critical spawning habitat, maintaining adequate stream flows, protecting water quality and limiting predation will be essential to re-establishing a viable population of June suckers.

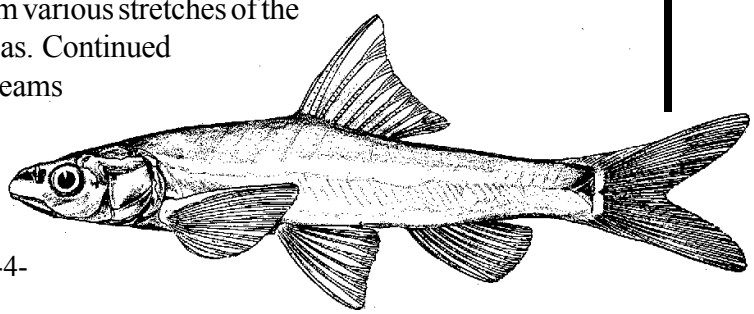
Woundfin: *Plagopterus argentissimus*

The woundfin belongs to a unique group of New World minnows with spiny fins. It derives its common name from an especially strong, sharp-pointed spine on its dorsal fin that can inflict a wound. It is a small (about three inches long), torpedo-shaped fish that lives to only about two years in age. They are a burnished silver color (their Latin species name *argentissimus* means "most silver"), with blue reflections on their sides, and have no scales. One especially notable feature is the well-developed barbels (sensors) found on the edge of their upper lip.

Woundfin are endemic to the lower basin of the Colorado River, and historically ranged throughout the Virgin River in Utah. Within their range, they prefer runs and quiet waters no deeper than 20 inches with sand or gravel bottoms, adjacent to shallow riffles. For spawning, they use swifter flowing waters over sandy or muddy bottoms.

Significant alteration of their habitat, including dam construction and water diversions, drastically lowered woundfin numbers, and they are now restricted to the lower portions of the Virgin River below LaVerkin in Washington County. Dewatering of their spawning streams has had extremely devastating impacts on their survival. In addition, competition with and predation by an introduced bait fish, the red shiner, has caused major declines.

In 1970, the woundfin was listed as an Endangered species. In the years since, efforts have been made to eliminate red shiners from various stretches of the Virgin River and restock woundfin into suitable areas. Continued threats of habitat degredation and dewatering of streams still pose serious problems for this species.



Biodiversity Activity — *Exotic Attack!*

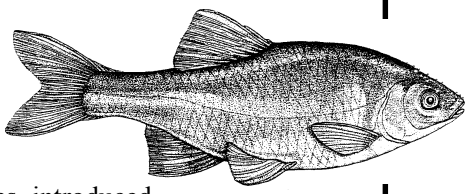
Goal: This physically involving simulation demonstrates the impact of an exotic species and environmental changes within an ecosystem.

Objectives: 1) students will be able to define and give examples of exotic species, 2) students will be able to describe the impact of exotic species on native species in an ecosystem, 3) students will be able to infer how ecosystem changes can increase the impact of an exotic species upon native species.

Materials: Gymnasium, school yard, or other playing area. Optional: Tokens (at least five for each student); five 12-foot long pieces of rope.

Background: An exotic species is a plant or animal species that has been introduced to an area that is not their native or original environment. Exotic species can be introduced into ecosystems in many ways. One way is for people to purposefully transport species for various reasons. European starlings and house sparrows, for example, were brought to Central Park from Europe by a man whose goal was to bring every bird mentioned by Shakespeare to America. Also, various game species have been introduced to enhance recreational opportunities for people. Scientists have even, on occasion, introduced an exotic species to new surroundings in an effort to control nuisance species. And unwanted pets such as turtles or aquarium fish are sometimes freed into the wild by people. Another way is accidentally. For example, ships can unknowingly deposit exotic species through the discharge of their balast waters and weed seeds can unintentionally be carried with grains.

An exotic species able to survive in a new environment must be relatively adaptable. This quality makes them especially problematic for native species. Exotics compete for a place or niche within their new ecosystem. Their successful establishment usually occurs at the expense of native species. And, in many cases, besides being good competitors, exotic species may also be aggressive predators. For threatened or endangered species, already in a vulnerable position, the invasion of an exotic species can be extremely devastating.



red shiner

Procedure:

1) Introduce the class to examples of exotic species that have had negative impacts within Utah ecosystems. Examples in Utah:Starlings, raccoons, feral horses, introduced trout species, various bait fish such as red shiners, bullfrogs, aquatic turtles, cheat grass, Russian thistle, purple loosestrife. For this simulation we will look at one that is an exotic predator in an aquatic ecosystem.

2) Tell students they're going to simulate the effect of an exotic species on native species within an aquatic ecosystem. They will be native, plankton-eating fish in a lake. A few will be an endangered species. Choose about a fourth of the students to be endangered. Explain that while non-endangered fish will be able to move about freely in the river, the endangered fish can only hop. Also choose one student to be the exotic species.

3) Tell them they all need to stay away from the exotic species. Since the exotic species is a predator, when it tags a fish, that fish dies and becomes part of the exotic species by attaching to it (joining hands). The joined exotics continue hand-in-hand in search of more natives, adding to the lengthening chain. The exotics can tag natives only with either of their free hands on the ends of the chain, but can split off as sets of two or more at any time.

4) To make the simulation more interesting, spread tokens throughout the playing area. Tokens represent plankton. Native fish must gather at least five tokens each. Effects of food shortages created by lowered water quality can be demonstrated by decreasing the number of food tokens in a second round. In addition, ropes can be used to create safe zones at the edges of the river, such as protected pools. Then, in another round, to demonstrate the impact of dewatering of the river, the safe zones can be removed.

5) State the boundaries and begin.

6) When the exotic has taken over, stop the simulation and bring students together. Have them discuss what happened in the river. Who disappeared first? Why? Why was the exotic species so successful? How does the simulation demonstrate the problems created when an exotic species is introduced into an ecosystem?

Resources

Swim Fast for These!

Call Project WILD at:
(801) 538-4719

Utah's Endangered Fish: Detailed information packet on Utah's Endangered fish species.

Utah's Endangered Species: Full-sized black and white poster depicting Endangered plant and animal species and their areas of occurrence in Utah.

Utah Sensitive Species List: Detailed list and information on Utah's sensitive species, prepared by the Utah Division of Wildlife Resources.

The Colorado River - Home to Native Fish for 2 Million Years: Poster featuring the four Endangered fish of the Colorado River Basin.

Rivers At Risk: Activity-based study guide for the Colorado River Basin.

The Day the Water Stopped: Poster of "1997 Young Artists' Water Education Poster Contest" winning entry by sixth grader Ken Klimaszewski.

Dams and Rivers - Primer on the Downstream Effects of Dams: Excellent full-color free publication from th U.S. Geological Survey. Call (800) 435-7627 and request Circular 1126.

Nature's Web - Caring for the Land: National Wildlife Week Packets for 1998.

Biological Diversity - Can We Live Without It?; and The Endangered Species Act - How it Works: Copies of two interesting and informative National Audubon Society Fact Sheets.

The Wide Whirld of Whirling Disease Poster: Fun, animated poster depicting the life cycle of whirling disease.

Invasive Weeds: A Growing Problem: Colorful poster featuring the problems caused by exotic plant species, produced by the Bureau of Land Management.

Check-out the following from Project WILD:

Swimming Upstream - The Endangered Fish of the Colorado River: Examines the Recovery Program for the Endangered Fish of the Upper Colorado aimed at recovering four endangered fish while allowing for future water development.

Fish Videos: "Eyewitness" video featuring natural history, adaptations, biodiversity, ecological interactions of species and cultural significance of fish, and a "Bill Nye the Science Guy" video on fish.

Biodiversity; Endangered Species: Rivers and Streams: Three Project WILD Resource Files, full of activity guides, videos, books, background information and other great supplemental materials.

Fish Internet Sites:

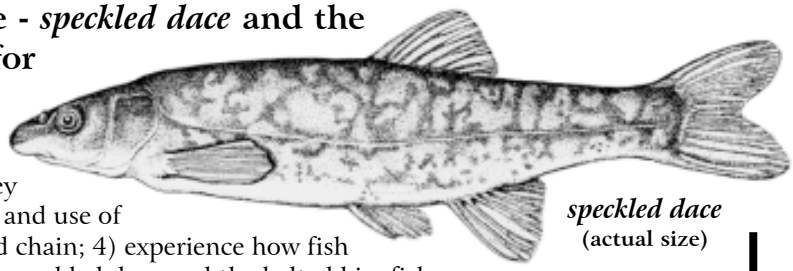
http://www.cnt.colostate.edu/CWK/nat_fish.htm
Native Fish of Colorado. Includes good info on several of Utah's endangered fish.

http://walrus.wr.usgs.gov/docs/projects/grandcan/fisheffects.html
Overview of the impact of dams on native fish, some discussion of current management.

http://rivers.oscs.montana.edu/dlg/aim/annelid/whirl5.html
Whirling Disease on the World Wide Web. Links to sites that deal with whirling disease in detail.

http://www.r6.fws.gov/coloradoriver
The Upper Colorado River Endangered Fish Recovery Program homepage.

Young children become Utah native wildlife - *speckled dace* and the *belted kingfisher*, to learn how fish compete for food and use their protective coloring to avoid becoming food themselves.



speckled dace
(actual size)

Objectives: Students will: 1) understand a basic predator/prey relationship; 2) experience why the adaptations of coloration and use of camouflage are important to a fish; 3) recognize a simple food chain; 4) experience how fish compete for food within their habitat; and 5) learn about the speckled dace and the belted kingfisher.

Method: Students engage in a fishy version of hide and seek, while role-playing a predator/prey relationship.

Background: In this activity, a belted kingfisher is the predator waiting to catch its prey, the speckled dace. Young students will benefit more when this activity is preceded by introductions to the basic needs of wildlife and the importance of animal colorations. See "The Beautiful Basics" and "Color Crazy" in the Project WILD activity guide.

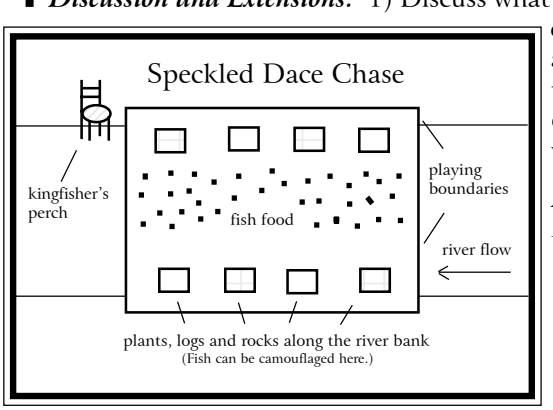
The *speckled dace* is a small fish, that thrives in rivers and streams throughout Utah. It usually lives in shallow sections of water, not more than three feet deep. It feeds on insects, freshwater shrimp and plant materials along mud and rock bottoms. It is gray-brown with dark speckles on top, a dark lateral band and a yellow or cream-colored belly. It sometimes has an orange streak. Color and markings help this little fish to be camouflaged along river banks and rocky stream bottoms. Camouflage helps it hide from predators, such as trout and belted kingfishers.

The *belted kingfisher* is a fishing bird that lives along Utah's rivers, streams and lakes. It is blue-gray with a bushy crest and distinctive dark or rust-colored bands across the chest. It has little feet, a large head and a big strong bill, which helps it to be a very successful predator. It hunts from a perch above water, usually using an overhanging tree. When it sees a fish, like the speckled dace, it dives down into the water to capture it.

Instructions and Materials: This is written for a group of nine students, one predator and eight prey. For the very young, the teacher plays the predator. For a larger group, double the recipe! 1) Set up ahead of time, using the diagram below. 2) Prepare a large floor space, inside or outdoors. This area is a section of river where speckled dace live. 3) Place eight carpet squares of two different colors along the river banks. Each represents a place where one fish can be camouflaged. 4) Prepare eight "fish wristbands" using contruction paper. Each must match in color one carpet square. Students who play a fish wear a wristband. When their "coloring" (wristband) matches the color of a rock, log or plant (carpet square), the fish can go to it and be camouflaged. 5) Prepare 100 1-inch square tokens of fish food. Scatter food in the river bed. 6) Place one sturdy chair on a corner of the area. This is the tree where a kingfisher perches.

Procedure: 1) Introduce the speckled dace and the belted kingfisher. Show photographs if you have them. Discuss the simple predator/prey relationship that exists between them. Illustrate it as a food chain. 2) Discuss the colors and markings on speckled dace. Introduce how these fish use camouflage to hide from kingfishers. 3) Give students a tour of the river area, while explaining the rules. *Speckled Dace Rules:* Fish must leave their hiding spots to eat. They dart out of hiding to pick up food, while the kingfisher is on its perch. When the kingfisher dives down, each fish swims to a spot along the river bank that matches its coloring and sits down - one fish per spot. If a fish is not safely camouflaged in a spot, the kingfisher can tap the fish on the wristband, that fish becomes food and is out. *Belted Kingfisher Rules:* The kingfisher sits on its perch and counts to 10. Then it dives down and tries to catch fish that are not hidden by camouflage. The kingfisher catches a fish by tapping its wristband - one fish per dive. It must walk the caught fish out of the river, return to its perch and count to 10. If the kingfisher trys to catch a fish and all are camouflaged, it must return to its perch. After counting to 10, the kingfisher is ready to hunt again. *Note:* Use the kingfishers' count to control the tempo of the game, making it longer or shorter, if needed. Older students can be assigned a number of food pieces they must collect to survive. 4) Begin the game. Have eight students with wristbands swim to a safe spot to be fish. Have one student fly to the tree to be the kingfisher. The game starts when the kingfisher begins counting to 10. Play until fish food has been eaten or until one fish is left.

Discussion and Extensions: 1) Discuss what happened. 2) Use variations: Add another predator; decrease the places a fish can be camouflaged; and decrease/increase the amount of fish food. For each, ask: *What changes occurred? Could this happen in nature?* 3) Using wildlife from this activity, begin a paper "food" chain to hang in the room. Add a link for each animal students come up with. Turn it into a food web. 4) Discuss new words: Predator, prey, food chain, camouflage and adaptation.



Fish Books: *Fiction:* Swimmy (1963) and Fish is Fish (1970), by Leo Lionni, Alfred A. Knoph, NY. *Nonfiction;* Where's That Fish?, by Brenner and Chardiet, Cartwheel Books, Scholostic Inc., NY, 1994; Fishes, by Brian Wildsmith, Oxford Univ. Press, Oxford, 1992; Under the Sea from A to Z, by Anne Doubilet, Scholastic, Inc., NY, 1991.

Issue Investigation

What's up with Utah's Native Fish?

The Good News: Although a relatively dry state, Utah was historically blessed with a good number of native fish species.

The Bad News: A large portion of these native fish species are in trouble; eight are federally listed as Threatened or Endangered, two are protected by Conservation Agreements and eight are classified by the state as Sensitive.

Although not a problem unique to Utah (in the past 100 years in North America, 40 fish species have gone extinct, and another 364 are threatened with extinction) you may be wondering what specifically has been going on with Utah's native fish species. Regionally, we can look at three different areas: The Colorado River Basin, the Virgin River and the rivers and lakes (specifically Utah Lake) of the Great Basin.There are several interesting stories to tell, with lessons to learn from them as well.

The Colorado River Basin: The Colorado River was once one of the world's most turbulent rivers. The fish, including the now Endangered Colorado squawfish, bonytail chub, humpback chub and razorback sucker, and the state Threatened roundtail chub, that thrived in its turbid and highly mineralized waters were specially adapted to these extreme conditions. Then in the 1930s came the construction of Hoover Dam, followed by Glen Canyon Dam, and a series of massive water control projects that greatly reduced water flow of this mighty river, radically altering the riverine environment.

The no longer warm, swift and turbid waters had become cold and clear, very unsuitable for successful survival and spawning of native fishes, but great habitat for some 40 exotic trout and other game fish which were subsequently introduced. Many exotic fish species, including large and small mouth bass, various sunfish species, channel catfish, and carp, to name a few, are predatory and feed aggressively on eggs and larvae of native fish, a factor that helped to further the decline of various natives.

The Virgin River: The Virgin River is home to the Endangered Virgin River chub and woundfin, the Virgin River spinedace, protected by a Conservation Agreement, and the state designated Sensitive desert sucker. In this watershed, a major problem for native fish species has been a drastic reduction in water flow within the river caused by the creation of dams, reservoirs, canals and other diversion structures to supply water for irrigation and municipal water use. Rising water demands in this rapidly growing region have, at times, resulted in bone dry spawning streams.

Another big problem has been a small fish, the red shiner, an exotic bait fish that was released into the watershed. Populations of the highly competitive red shiners became excessively large and severely impacted survival of the native fish species. In addition, exotic species such as spiny soft-shelled turtles and bullfrogs, which prey heavily upon the eggs and larvae of native fish, have also caused problems.

Great Basin Rivers and Lakes: Events in the rivers and lakes of the Great Basin have had their toll on three other native fish species, the now extinct Utah Lake sculpin, the Endangered June sucker and the least chub. Populations of June suckers and the Utah Lake sculpin, two species adapted to the saline, shallow waters of Utah Lake were severely decreased by a series of droughts in the 1930s. Water shortages led to a drastic lowering of the level of the lake, and a severe winter that followed caused the lake to freeze, killing a majority of the fish struggling to hang on. The already low-in-number and especially water quality-sensitive sculpin was most likely eliminated by this series of events.

June sucker numbers were so low, they began to mate with a closely related species, the Utah sucker, creating a hybrid species. This no longer genetically pure hybrid is now considered its own species. Currently less than 1,000 June suckers, most of which are very old (25 years +) survive in Utah Lake and the mouth of the Provo River. Recruitment of young has been hampered by the presence of predatory game fish introduced in the 1950s. In addition, hydrodynamics and temperature regimes of the river have been significantly changed by an array of water development projects that have been completed in the years since. Increased discharge of industrial and municipal effluent into Utah Lake has altered the suitability of this habitat as well.

Glen Canyon Dam

The least chub, once widespread in watersheds of the Wasatch Front and across the Great Basin, is now restricted to a few saline and warm spring-fed basins in the Snake Valley of western Utah, a small region in Juab Valley, and a portion of the Sevier River drainage. Driven to the extremes of their range by exotic game fish and predatory bait fish such as the mosquito fish, they survive only where these other fish cannot.

What's Being Done to Help?

The Colorado River Basin: In 1984, an Upper Colorado River Basin Coordinating Committee consisting of representatives from federal and state agencies, including Utah, was created to address the plight of native fish species in this region. Ongoing efforts to stave off extinction of these endangered fish have included attempts to maintain adequate stream flow throughout the system, prescribed releases from reservoirs, such as the recent experimental release of waters from Glen Canyon Dam, habitat restoration, population monitoring, captive propagation and restocking, and establishing refuges free of exotic predatory fish species. Despite intensive recovery efforts, however, viable populations of these species have not yet been established. Many scientists believe the original habitat has been so drastically altered that turning back the clock may be virtually impossible.

The Virgin River: In the Virgin River watershed, a Virgin River Fishes Recovery Team is exploring ways to enhance the populations of both woundfin and the Virgin River chub. Efforts have been made to eliminate red shiners from portions of the river, and a captive population of Virgin River chubs has been maintained as insurance against extinction and as a source of fish for ongoing restocking projects.

Great Basin Rivers and Lakes: In Utah Lake, recovery efforts have involved continuous monitoring of spawning populations in the Provo River, maintaining captive brood stock for research and stocking programs, and attempting to prohibit water projects that could destroy remaining spawning habitat. In addition, a Utah Lake Fish Management Advisory Team was recently established as part of Central Utah Project mitigation activities, to create a more intensive recovery plan. Native fish recovery is to be the top priority for Utah Lake, and part of this plan may lead to the construction of a native fish hatchery.

Recovery of the least chub falls under the state's jurisdiction via a Conservation Agreement forged in 1996 with the U.S. Fish and Wildlife Service. So far, under this plan, private land where a remnant population of least chubs was found was purchased. Also, on Bureau of Land Management grazing allotments, fences to exclude cattle from springs have been built. And, a population of least chubs was successfully reintroduced into suitable habitat within Fish Springs National Wildlife Refuge.

Why All The Fuss? Some scientists estimate that we lose thousands of species worldwide each year, a rate far exceeding rates of natural extinction in the past. Why should this matter? The arguments espousing the value of maintaining biological diversity (or biodiversity), the preservation of species, species genetic diversity and diversity of habitats, are myriad.

Included are: A purely utilitarian viewpoint that species may have some economical, medicinal or other benefit to humans; an ecological viewpoint that stresses how diversity enhances stability of life support systems that humans, as well as all other living organisms, depend upon; and a moralistic viewpoint that purports that we, as decent human beings, do not have the right to cause the extinction of other species. Unfortunately for them, it's unlikely that any of Utah's endangered fish species are going to make anyone rich or lead to a cure for cancer. Support for them will have to be for another reason.

What Can You Do To Help? Just a few simple things can help. Practicing water conservation is one of the best ways to lessen the overall demand for water and prevent the need for construction of dams and diversion of water from rivers. People can also write their congressional legislators requesting support for a strong Endangered Species Act. In addition, when fishing areas inhabited by native fish, consider eating non-native trout that are caught instead of throwing them back, and avoid dumping excess bait fish into rivers. Also, do not release wild exotic pets, such as aquarium fish or turtles that are no longer wanted, into the wild.

Our ability to think about species other than ourselves is a human quality. To save or eliminate them is a human choice. Continuing to unravel the web of life could be unwise.

Action During the spring of 1991, in a series of private trout hatcheries, and in nearby streams and lakes of the Fremont River drainage in Wayne County, a strange phenomenon was noticed. Otherwise healthy populations of trout were suddenly stricken with debilitating deformities of the head and spine. Some young fish, especially susceptible to whatever was causing the deformities, exhibited such strange symptoms as a whirling behavior and blackened tails. Division of Wildlife Resources biologists investigating this strange outbreak were quick to identify the malady as whirling disease. Since that time, whirling disease has been identified in private hatcheries and adjacent waters in Weber, Cache and Sevier counties. This import from Europe has been known in the United States since the 1950s but has only recently become a major threat to salmonid populations in Utah.

Whirling disease is a condition that affects both native and introduced trout and salmon, and is caused by a microscopic parasite known as *Myxobolus cerebralis*. During the development of a young fish, the parasite attacks the cartilage of the spine and head, resulting in twisted spines, odd-shaped heads and damaged balance centers of the inner ear. In severe attacks, the infestation may even result in the death of the young fish. Due to the deformities, surviving fish are often less able to feed, are more sensitive to changes in the environment, and are less able to escape predators, exhibiting the whirling motion indicative of the disease as they attempt to flee.

The life cycle of *M.cerebralis* is quite complex, requiring two separate hosts in order to be completed. Tiny worms (*Tubifex tubifex*) anchored to the bottom of a water body will ingest the spores of *Myxobolus*. Within the digestive tract of the tubifex worm, the spores of *Myxobolus* develop into the infective *Triactinomyxon* (referred to as TAM). The mature *Triactinomyxon* spores are released into the water where they can infect otherwise healthy trout. Trout can be infected by either eating infected tubifex worms, or by coming in contact with the spores of the *Triactinomyxon*. Once inside the body of the fish, the parasite attacks the cartilage. Very young fish may die at this point in time, while those fish infected as adults may show few or no symptoms. Within three or four months following the initial infection, the *Triactinomyxon* give rise to *Myxobolus* spores within the body of the infected fish. These spores are released back into the water when an infected fish dies and decomposes, starting the infectious cycle anew.

Whirling disease is rapidly becoming a serious threat to wild trout and whitefish populations in Utah. Though no known cure for this disease is known at this time, there are several precautions, listed below, people can take to help prevent the spread of whirling disease.

- Clean all equipment (boats, boots, trailers, etc.) of mud before leaving a fishing area. Thoroughly dry all equipment in the sun before using it in another water. Cleaning equipment with a strong solution of chlorine bleach will kill any spores on your equipment.

- Never transport live fish from one body of water to another. Not only is this practice illegal, but doing so could help spread the whirling disease parasite. Avoid transferring fish from one stretch of a river to another.

- Avoid disposing of fish or their parts in any body of water. Fish parts should be disposed of by deep burying, burning, or by being placed in the garbage.

If you observe signs of whirling disease, or if you observe illegal stocking of fish, contact your local conservation officer, or notify the Division of Wildlife Resources at (800) 662-3337.

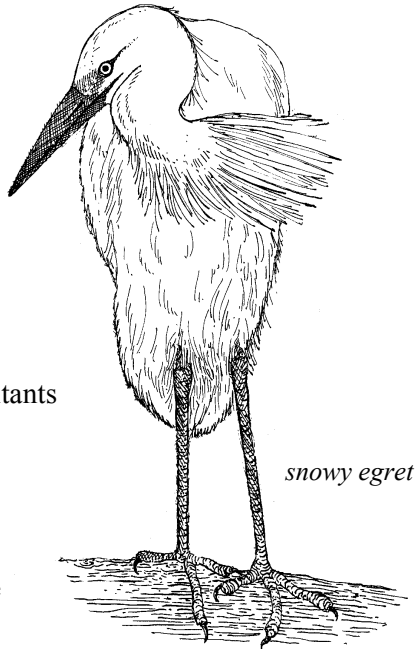
Additional information and resources on whirling disease, including educational videos and materials, are available from the Utah Division of Wildlife Resources at (801) 538-4717.

Advanced Wildlife Workshop

Wonderful Wetlands!

July 10-12

Project WILD invites you to come and explore Fish Springs National Wildlife Refuge, a unique wetland ecosystem in the Great Basin Desert. Located on the historic Pony Express Trail, Fish Springs serves as a critical resting and nesting site for thousands of migratory birds, and provides essential habitat for rare fish and other aquatic species. This is a special opportunity to go behind the scenes of a National Wildlife Refuge and to learn from biologists while helping them collect data.



snowy egret

During this hands-on workshop, participants will:

- discover the importance of these unique wetlands to wildlife within the Great Basin Ecosystem;
- collect and interpret biological data;
- gain a greater understanding of wetland management;
- explore cultural history and the relationship of early Utah inhabitants to the area;
- receive a variety of useful teaching materials including a copy of "WOW! The Wonders of Wetlands" activity guide.

An oasis in the desert, Fish Springs National Wildlife Refuge is one of Utah's most fascinating wetland ecosystems. All meals will be provided and lodging will include bunk housing or camping. Become a "real" biologist for the weekend, and plan to get wet and mucky.

Deadline to Register: June 24, 1998

- Workshop fee is $30. Limit 20 people.
- Prerequisite: Completion of a Basic Project WILD Workshop.
- USU Graduate level Credit available (2 hours for $20. Register at workshop)
- Project WILD will run a shuttle from the Wasatch Front. Participant list will be provided for others to arrange carpooling.
- Times: Afternoon of the 10th through morning of the 12th.
- Questions: call (801) 538-4719 or (801) 538-4720
- Send registration to: **Project WILD, UDWR, PO Box 146301, Salt Lake City, UT 84114-6301**

Return form with $30 check payable to UDWR.

Name _____ Phone (h) _____ (w) _____

Address _____

Occupation _____

Project WILD Workshop taken when? _____ and where? _____

_____ I need transportation from Salt Lake City.

project WILD®

Utah Division of Wildlife Resources
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Salt Lake City, Utah 84116

Growing WILD is written by Fred Hayes, Diana Vos and Audrey Walker. Edited by Vicki Unander. Illustrators: Alan Rawley, Marianne C. Filbert and Yvette Converse, plus additional clip-art selections.

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